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A New Lanternshark *Etmopterus splendidus* from the East China Sea and Java Sea

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Abstract A new species of the lanternshark *Etmopterus splendidus* is described. This new species is distinguished from the congeners by the combination of the following characters: distance from snout tip to 1st dorsal spine much less than distance from the spine to upper caudal origin; caudal fin short, much less than head length; dermal denticles on lateral side of trunk with very small, erect thornlike, conical crowns, those on trunk arranged in regular longitudinal rows, and distinctly arranged on interdorsal area and on lateral trunk of interspace between 2nd dorsal and caudal, but not arranged in regular longitudinal rows on dorsal surface of interorbital and on abdomen; color in life purplish-black above and with inconspicuous bluish-black flank marks and three other bluish-black marks at base of caudal fin and along its axis; shape of flank marks narrow anterior to, but broader posterior to pelvic fins.

The genus *Etmopterus* is characterized within the family Squalidae as having a strong spine extending along the anterior margin of each dorsal fin, unicuspid teeth with recumbent cusp in the lower jaw, and multicuspid teeth in the upper jaw.

The species of *Etmopterus* are divided into three main groups by the shape of the dermal denticles: (1) denticles with low, flat, concave sessile crowns; (2) denticles with erect thornlike, cuspidate crowns and arranged in regular longitudinal rows; and (3) denticles with erect thornlike, cuspidate crowns and not arranged in regular longitudinal rows. Group (1) includes *E. pusillus* from the Atlantic and *E. frontimaculatus* from the Pacific. Nakaya (1982) reported a species from Kyushu Palau Ridge with denticles similar to those of *Etmopterus pusillus* but with longer snout. Krefft (1968) stated that *E. frontimaculatus* should be placed in the synonymy of *E. pusillus*, but Dolganov (1986) claimed that *E. frontimaculatus* was a valid species. Group (2) was reviewed by Yamakawa et al. (1986) and they reported 6 species. Dolganov (1986) reported a new species *E. schmidti* from Sagami Bay in Japan. Group (3) includes at least 13 valid species. Compagno (1984) reviewed this group of *Etmopterus* and reported 11 species. Springer and Burgess (1985) added to this group two new species from the Caribbean coast of Colombia.

Methods

Measurements followed Yano and Tanaka (1983). Vertebral counts were made according to the method of Springer and Garrick (1964). Dermal denticles were studied under a binocular microscope and photographed with a scanning electron microscope. Soft X-ray were used to make radiographs of the vertebrae. Institutional abbreviations are shown below: AMNH, American Museum of Natural History; BMNH, British Museum (Natural History); FUMT, University Museum, University of Tokyo; MCZ, Museum of Comparative Zoology, Harvard University; NSMT, National Science Museum, Tokyo; TMFE, Department of Fisheries, Faculty of Marine Science and Technology, Tokai University; USNM, United States National Museum of Natural History, Smithsonian Institution; VIMS, Virginia Institution of Marine Science.

Comparative materials

Group (1): *Etmopterus pusillus*, BMNH 1855. 11. 29. 27, syntype, female, 315 mm total length (TL), 255 mm body length from snout tip to upper caudal origin (BL), male, 208 mm TL, 159 mm BL, Madeira.

Group (2): *E. abernethyi*, MCZ 39714, paratype, female, 274 mm TL, 210 mm BL, 7 miles south of Kaikoura (New Zealand), 150 m depth, Feb., 1956, (=*E. molleri*); *E. brachyurus*, USNM 70257, holotype, male, ? TL, 189 mm BL, off Jolo Island (Philippines); *E. bullisi*, USNM 158186, holotype, female, 192 mm

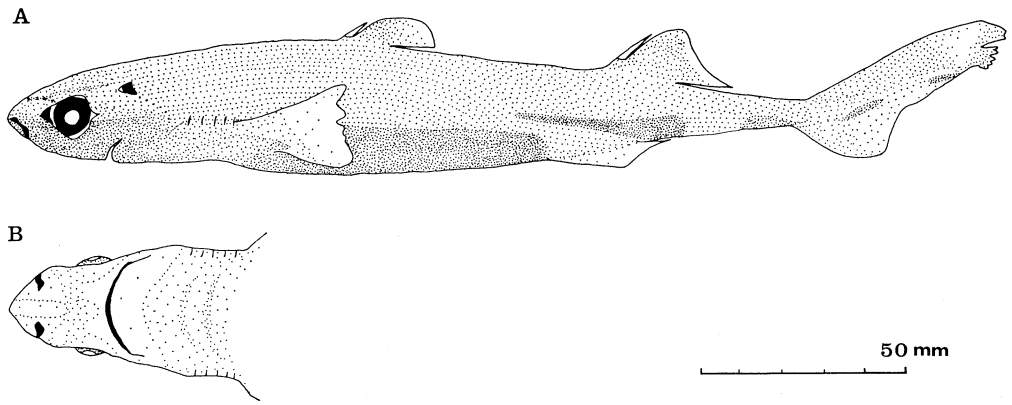

Fig. 1. Holotype of *Etmopterus splendidus* sp. nov., NSMT-P 50273, female, 247 mm TL. A, lateral view; B, ventral view of head region.

TL, 144 mm BL, 30°02′N, 80°05′W (Northeast coast of Florida), 1 May, 1956; *E. granulosus*, BMNH 1879. 5. 14: 460, holotype, male, 255 mm TL, 192 mm BL, Chile; *E. lucifer*, TMFE 599, female, 312 mm TL, 244 mm BL, off Ukusu in Suruga Bay, 200 m depth, 27 Sep., 1981; *E. molleri*, female, 398 mm TL, 318 mm BL, 24°04.2′N, 123°57.9′E (off Hateruma Island, Okinawa), 615 m depth, 18 Dec., 1984; *E. polli*, MCZ 38001, holotype, male, 187 mm TL, 147 mm BL, 6°08′S, 11°24′E (off northern Angola), 350–380 m depth; *E. villosus*, USNM 51583, holotype, male, 164 mm TL, 128 mm BL, Molokai Island (Hawaii), 333–747 m depth, 1 Apr., 1902.

Group (3): *E. baxteri*, male, 375 mm TL, 287 mm BL, 44°39′S, 172°53′E (New Zealand), 476–515 m depth, 8 Mar., 1983; *E. carteri*, USNM 206090, holotype, female, 190 mm TL, 144 mm BL, 11°09′N, 74°26′W (off Barranquilla, Colombia), 283–292 m depth, 19 May, 1964; *E. decacuspidatus*, BMNH 1965. 8. 11: 7, holotype, male, 284 mm TL, 221 mm BL, 16°40.5′N, 109°49.9′E (120 miles of Cape Bastion, Hainan) 420–567 m depth, 5 Mar., 1965; *E. gracilispinis*, AMNH 35390, female, 128 mm TL, 98 mm BL, 35°56′N, 74°48′W (off Roanoke Island), 2 Nov., 1975; *E. hillianus*, MCZ 1025, holotype, female, 219 mm TL, 182 mm BL, Cuba; *E. perryi*, USNM 206093, holotype, female, 178 mm TL, 135 mm BL, 11°09′N, 74°25′W (off Barranquilla, Colombia), 292 m depth, 19 May, 1964; *E. princeps*, VIMS 06678, male, 459 mm TL, 344 mm BL, 39°58.1′N, 68°54.9′W (Middle Atlantic Bight), 1068–1395 m depth, 9 May, 1980; *E. schultzi*, USNM 113381, holotype, male, 255 mm TL, 191 mm BL, 29°11′N, 86°52′W (Gulf of Mexico), 457 m depth, 24 Feb., 1951; *E. spinax*, AMNH 49503, male, 214 mm TL, 161 mm BL, 60°22.3′N, 10°36.3′W (Bill Baiky), 600–606 m depth, 26 Sep., 1981; *E. unicolor*, TMFE 1882, male, 520 mm TL, 415 mm BL, off Okitsu in Suruga Bay, 1200 m depth, 14 May, 1983; *E. virens*, USNM 160859, holotype, male, 185 mm TL, 137 mm BL, 27°51′N, 91°32′W (Gulf of Mexico), 330 m depth, 11 Nov., 1951.

Etmopterus splendidus sp. nov.

(New Japanese name: Futoshimi-fujikujira)
(Fig. 1)

Holotype. NSMT-P 50273, immature female, 247 mm TL, 194 mm BL, 79.0 g in body weight, 31°46.0′N, 129°43.8′E (off Shimo-Koshiki Island, Japan), 210 m depth, line fishing (R/V Tansei Maru), 26 April, 1986.

Paratypes. FUMT-P 10245, female, 298 mm TL, 241 mm BL, off Nagasaki, Japan, December, 1984. BMNH 1986. 11. 27: 86–88, female, 178 mm TL, 143 mm BL, female, 203 mm TL, 160 mm BL, mature male, 227 mm TL, 179 mm BL, 8°43′S, 114°15′E (off Java Island, Indonesia), 120–200 m depth, trawl net (R/V Jurong), 19–23 August, 1980.

Diagnosis. Distance from snout tip to 1st dorsal spine much less than distance from the spine to upper caudal origin. Caudal fin short, less than head length. Dermal denticles on lateral trunk with very small, erect thornlike, conical crowns. Denticles on trunk arranged in regular longitudinal rows, and distinctly arranged on interdorsal area and on lateral trunk of interspace between 2nd dorsal and caudal, but not arranged in regular longitudinal rows on dorsal surface of interorbital, on abdomen, on bluish-black flank marks above pelvic fins, and on marks of caudal fin base and axis. Color in life purplish-black above, with inconspicuous bluish-black flank marks and three other bluish-black marks at base

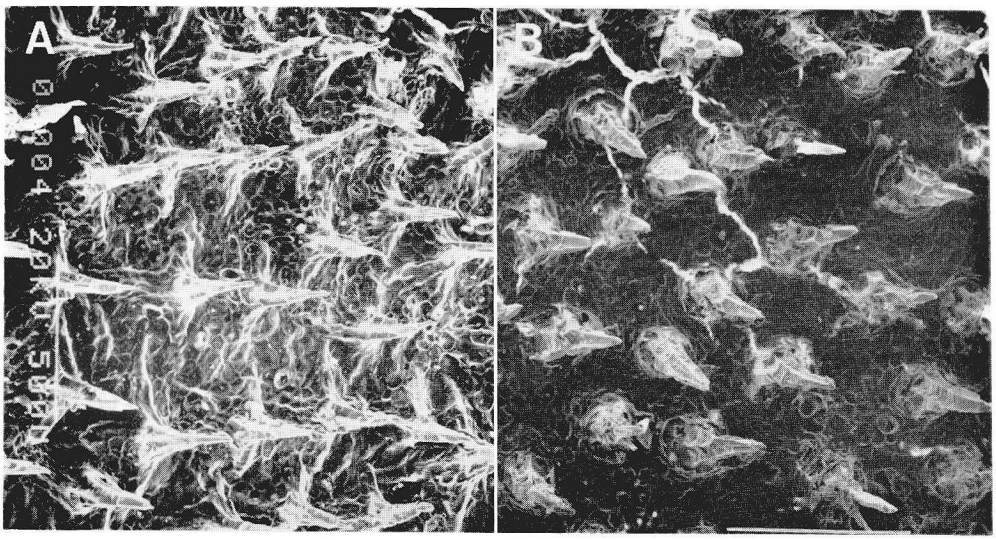

Fig. 2. Dermal denticles of *Etmopterus splendidus* sp. nov., NSMT-P 50273. A, denticles of trunk below 1st dorsal fin; B, denticles of abdomen between pectoral fins. Each scale bar indicates 500 μm.

of caudal fin and along its axis, shape of flank marks narrow anterior to, but broader posterior to pelvic fins.

Description. In the following, holotype values are followed by paratype values in parentheses. Trunk subcylindrical, head somewhat flattened, head measured to 5th gill opening 3.34 (3.40–3.58) in BL. Height of trunk at origin of pectoral 6.45 (7.15–8.52) in BL. Snout short and rounded, its length 1.20 (1.20–1.25) in horizontal diameter of eye and 1.68 (1.40–1.75) in interorbital width. Length from snout tip to mouth 0.81 (0.92–1.05) in posterior margin of eye to 1st gill opening. Eye moderately large, horizontal diameter of eye 3.87 (3.92–4.25) in head. Spiracle semicircular, greatest diameter of spiracle 3.75 (3.33–5.33) in horizontal diameter of eye. Prespiracular head length 0.84 (0.92–1.00) in length from anterior margin of spiracle to pectoral origin. Gill openings small and vertical. Nostrils moderately large, slightly oblique, nasal flaps poorly developed. Interspace between nostrils 3.06 (2.67–3.75) in preoral length. Mouth slightly arched, its width 1.16 (0.94–1.09) in preoral length. Length from snout tip to 1st dorsal spine 1.32 (1.48–1.57) in length from 1st dorsal spine to origin of upper caudal fin. Length base of 1st dorsal fin 1.54 (1.44–1.73) in that of 2nd dorsal fin. Height of 1st dorsal fin 1.59 (1.67–2.25) in that of 2nd dorsal fin. Length of 1st dorsal spine 2.13 (2.00–2.33) in height of 1st dorsal fin. Second dorsal spine large, its length 1.17 (1.00–1.13) in height of 2nd dorsal fin. Interdorsal space 1.15 (0.93–1.05) in length from snout tip to pectoral origin. Rear end of 1st dorsal base nearer to rear margin of folded pectoral fin than to pelvic origin, length from rear margin of pectoral to rear end of 1st dorsal base 7.30 (6.00–8.40) in length from rear margin of pectoral to pelvic origin. Length of pectoral base 1.96 (1.50–2.11) in length of anterior margin of pectoral. Interspace between pelvic and caudal 1.46 (1.24–1.58) in that between pectoral and pelvic. Caudal fin short, less than head length. Caudal fin with well-marked subterminal notch. Length of lower caudal lobe 1.96 (1.81–2.09) in that of upper lobe.

Teeth, 17-17/18-18 (13–17-13–16/15–20-16–20), dissimilar in upper and lower jaws. Upper with five cusps in female specimens but seven cusps in male specimen, lower unicuspid shaped. Three series of teeth functional in upper, one series in lower.

Dermal denticles on lateral trunk with very small, erect thornlike, conical crowns (Fig. 2). Denticles on lateral trunk arranged in regular longtudinal rows, and distinctly arranged on dorsal surface of interdorsal area and on lateral trunk of interspace between 2nd dorsal and caudal, but not arranged in regular longitudinal rows on dorsal surface of interorbital, on abdomen, on

bluish-balck flank marks above pelvic fins, and on marks of caudal fin base and along its axis; 2nd dorsal base of holotype and BMNH paratypes with denticles, but that of FUMT paratype without denticles.

Distal margins of fins largely covered with skin, not fringed with naked ceratotrichia.

Color in life purplish-black above, and underside of snout and abdomen grading to bluish-black with inconspicuous bluish-black flank marks running ahead and behind pelvics and three other bluish-black marks at caudal fin base and along its axis, but color of holotype specimen freshly preseved in 10% formalin and BMNH paratypes preserved in 70% alcohol brownish-black above and underside of snout and abdomen grading to bluish-black, with inconspicuous bluish-black flank marks and three other marks; color of FUMT paratype preserved in 70% alcohol brown above underside of snout and abdomen grading to brownish-black with conspicuous brownish-black flank marks and three other brownish-black marks at caudal fin base along its axis; shape of flank marks narrow anterior to pelvics but broader posteriorly and not pointed; color of margins of pectorals, pelvics and dorsals white.

Total vertebral number 80 (78–82), monospondylous 39 (37–39), and precaudal 57 (56–58).

Number of turns in spiral valves 10.

Proportional dimensions are given here as percentages of total length for the holotype followed parenthetically by the paratypes.

Snout tip to: outer nostril, 1.8 (1.7–2.4); eye, 5.1 (4.4–4.9); spiracle, 13.0 (11.0–12.3); mouth, 10.5 (7.9–8.4); 1st gill opening, 19.0 (16.8–18.0); 3rd gill opening, 21.5 (19.8–20.8); 5th gill opening, 23.5 (22.0–23.6); pectoral origin, 23.7 (22.5–23.6); rear margin of pectoral when laid back, 35.2 (31.0–33.0); pelvic origin, 51.8 (50.6–53.4); cloaca, 57.1 (53.9–57.4); 1st dorsal origin, 32.8 (28.6–30.9); 1st dorsal spine origin, 33.4 (30.4–32.6); 2nd dorsal origin, 57.9 (56.2–59.7); 2nd dorsal spine origin, 59.7 (58.6–62.8); upper caudal origin, 78.3 (78.8–80.9); lower caudal origin, 76.5 (75.3–78.9).

Eye: horizontal diameter, 6.1 (5.3–5.9); interorbital width, 8.5 (6.9–7.9).

Spiracle: greatest diameter, 1.6 (1.0–1.7).

Gill opening length: 1st, 1.6 (0.9–2.3); 3rd, 1.6 (0.9–1.7); 5th, 1.6 (0.9–1.7).

First dorsal fin: overall length, 9.7 (7.9–9.3); length base, 5.3 (3.9–5.4); length base from exposed spine, 3.6 (3.5–4.0); height, 3.4 (2.0–2.6); length spine, exposed portion, 1.6 (1.0–1.7).

Second dorsal fin: overall length, 14.2 (11.3–14.1); length base, 8.1 (6.4–8.4); length base from exposed spine, 6.1 (5.7–6.7); height, 5.5 (4.4–5.1); length spine, exposed portion, 4.7 (4.4–4.7).

Pectoral fin: length anterior margin, 10.7 (7.4–8.7); length base, 5.5 (4.0–5.1).

Pelvic fin: overall length, 12.6 (8.4–11.7); length base, 8.5 (4.4–6.4).

Caudal fin: length upper lobe, 20.7 (18.8–22.2); length lower lobe, 10.5 (10.1–11.8).

Trunk at pectoral origin: width, 13.4 (10.6–11.4); height, 12.2 (9.3–11.2).

Distance between bases: 1st and 2nd dorsal, 20.7 (22.5–24.2); 1st and 2nd dorsal spine, 22.3 (23.6–26.5); 2nd dorsal and upper caudal, 13.2 (13.3–15.2); pectoral and pelvic, 24.3 (23.2–26.5); pelvic and lower caudal, 16.6 (16.8–19.1).

Biological notes. The holotype was caught with night line fishing at depth of 210 m off Shimo-Koshiki Island, East China Sea, Japan. The bait used was squid. BMNH paratypes were caught with night trawl nets at depths between 120–200 m off Java Island, Indonesia. The holotype specimen is an immature female. The ovaries weighed 0.19 g and contained about 30 ova measuring 2–3 mm in diameter, and the threadlike uteri measured 2 mm in diameter. The paratype male (227 mm TL) was considered to be mature since it had hard claspers with spurs. The stomach of the holotype was empty but the intestine included squid beaks and lenses.

Remarks. The new species is included in Group (2) whose denticles are erect thornlike, cuspidate crowns and arranged in regular longitudinal rows. *E. splendidus* differs from the other species of Group (2) in the following characters: from *E. lucifer*, *E. brachyurus* and *E. molleri* in lacking long and narrow flank marks before and behind pelvic fins; from *E. granulosus* in having flank marks extending to front of pelvic origin, shape of the marks behind pelvics broad, three marks at caudal fin base and along its axis (two marks in *E. granulosus*) interspace between pectorals and pelvics about equal to head length and rear margin of pectoral fin when laid back, over 1st dorsal spine; from *E. bullisi* in having a short caudal fin, less than head length and lacking long and narrow flank marks running before and behind pelvic fins; from *E. villosus* in having distance from

snout tip to first dorsal spine much less than distance from spine to upper caudal origin.

Compagno (1984) included *E. polli* in Group (3). But I observed that the denticles of the holotype of *E. polli* are mostly arranged in regular longitudinal rows. But *E. splendidus* differ from *E. polli* in having interspace between pectorals and pelvics longer than interspace between pelvics and lower caudal origin. Dolganov (1986) reported a new species, *E. schmidti*, which has long and narrow flank marks at ahead and behind pelvic fins. I think that *E. schmidti* is a synonym of *E. brachyurus* or *E. molleri* judged by the illustration of Dolganov (1986).

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東シナ海とジャワ海から得られた1新種フトシミフジクジラ *Etmopterus splendidus*

矢野和成

東シナ海とジャワ海から得られた1新種フトシミフジクジラを記載した．本種は吻端から第1背鰭棘までの長さが，棘から尾鰭上葉起部までの長さより明らかに短いこと，尾鰭の長さが頭長よりも短いこと，鱗は非常に小さく棘状であり，体側面ではほとんど規則正しく配列しているが，頭部背面の眼間付近および腹部では明瞭に配列していないこと，生きている個体の体色は上方部では紫色がかった黒色，一方腹部，腹鰭上方部の斑紋，尾鰭の斑紋は濃い藍色をしていること，腹鰭上方部の斑紋が後方部で幅が広いこと等で他種と容易に区別される．

(102 東京都千代田区紀尾井町 3–27　海洋水産資源開発センター)